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The Effect of a Double Ceiling in the Administration of the Revised Stanford-Binet Scale

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THE EFFECT OF A DOUBLE CEILING IN THE ADMINISTRATION OF THE REVISED STANFORD-BINET SCALE

BY

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CHAPTER I

INTRODUCTION

The present study reopens, from a different angle, the question of testing beyond the conventional stopping point on the Revised Stanford Binet. For the purpose of clarity some of the fundamental principles of mental testing are here reviewed.

Intelligence can be studied only through its manifestations in individual behavior. Likewise, that is the only way in which it can be measured. Since any one test item will display only one aspect of a person's intelligence, the Binet scale was so devised as to include an extended series of different types of tasks which call for the exercise of "intelligence." On each task, the subject adjusts his total self to a specific situation, and his reaction can then be compared with the reactions of many other subjects who have performed the same task.

In the Binet scale and its revisions, the tests are arranged according to mental age levels, selected as suitable for each age level after due statistical study. In preparing the latest revision of the Stanford Binet (1937), a great number of test items were tried out experimentally on about a thousand subjects whose mental ages had been determined by the original Stanford Binet scale. Each test was given to at least twenty subjects of each mental age in the range in which it was applicable (10:8). Chronological age groups were used in the preliminary tryouts of the pre-school range. The most satisfactory tests were then retained and given a provisional age location.

After the sifting process, two provisional scales, Form L and Form M, were made up for the final tryout and were administered to more than 3000 subjects, covering a very comprehensive age range (10:11). Then, the less satisfactory

tests were eliminated and the scales were revised further to achieve "correct" standardization--to locate the separate tests and to give them adequate amount of credit in order to yield a mean I.Q. of 100 at each level. In Form L, six successive revisions were made, which involved shifting about of tests, modifying the standard of scoring to make it fit at a given age level, besides giving due consideration to the need for variety among tests, correlation with the total score, ease of scoring, economy of time, etc. (10:23). The authors of the revision felt that their objective in regard to the relative difficulty of the scale at the various age levels had been closely approximated. However, they stated that in three areas there were significant deviations from the 100 I.Q.: below age 4, from 8 to 12, and above 15. "In the area from 8 to 12 it is possible that the standardization is about 2 I.Q. points in error in the direction of too great leniency." In general, the probable error in I.Q. was found to be approximately .03 times the I.Q. (10:46).

The authors list three requirements necessary to secure valid results in using the Revised Stanford-Binet scale (10:52):

> 1) the standard procedures must be followed; 2) the child's best efforts must be enlisted by the establishment and maintenance of adequate rapport; and 3) the responses must be correctly scored.

In regard to the first requirement, "standard procedures" refers primarily to each test situation (10:52).

> The procedure for giving these tests has been carefully standardized for each test situation and should be followed without deviation.

The first requirement also includes the order in which tests are to be given to a child, i.e., as they appear in the manual and record booklet. However, in discussing the standard procedures, as well as scoring standards, the authors do not discuss the range of testing. It is not at all evident that the concept

"standard procedures" precludes testing below the first basal or beyond the first level of failure.

In the 1916 Stanford revision of the Binet-Simon scale, consideration was given not only to thoroughness but also to possibility of fatigue in recommending a desirable range of testing. Though it was desirable to establish a basal age at a level where all tests were passed and to continue through higher levels until a test group was found in which all tests were failed, this was not always practicable. The 1916 manual states (9:129):

> In testing normal children, little error will result if we go back no farther than the year which yielded only one failure, and if we stop with the year in which there was only one success. This is the lowest permissible limit of thoroughness. Defectives are more uneven mentally than normal children, and therefore scatter their successes and failures over a wider range. With such subjects it is absolutely imperative that the test be thorough.

The 1937 revision contains 39 more tests than the first Stanford revision. The tests in the second revision provide a "richer sampling of abilities, and the procedures have been more rigidly defined." The scale is more thorough below the five-year level, since tests are located at half-year intervals. The gaps at years eleven and thirteen were filled, and two supplementary superior adult levels were added (10:4).

The authors also require greater thoroughness in the range of testing. The 1937 manual states (10:63):

> In the case of children who are presumably somewhere near average in ability, it is usually good practice to begin with the group of tests just below the child's chronological age. However, if the examiner has overestimated the subject's intelligence and there is a failure in the tests of that group, it is necessary to go back and give all of the tests of the previous age group, and so until a level has been reached where all of the tests are passed. This point is the basal age level. In like manner, the examination should be carried up the scale until an age level has been found in which all the tests are failed.

The authors recognize the possibility of success beyond the first ceiling (10:63):

> It sometimes happens that a subject passes all of the tests at a higher age level than the one in which the first failure occurs. Again he may pass tests beyond the age group at which he has failed all the tests. In testing normal children little error will result if we go back no farther than the first year in which no failures occurred, and if we stop with the first year in which there was no success.

The above passage certainly implies the permissibility of testing beyond the first level of failure. The authors continue with a further statement to corroborate this. Tests passed beyond the first level of failure are validly considered part of the mental age (10:63):

> In computing the mental age, all successes and failures are taken account of, including any failures that may have occurred below the basal age level, and successes beyond the first year at which all tests have been failed.

The revised scale allows for a wider scatter of successes simply because there is a richer sampling of abilities and a decrease in the magnitude of the intervals between successive age levels throughout the scale.

The manifestations of the intelligence of a given individual on given tasks of a scale such as the Revised Stanford-Binet will be uneven. The ability of the individual to adjust to a specific task will be influenced by his experience and training, as well as by other non-intellectual factors which are within the person, since the "whole person" reacts to the task. So, if it is not unusual for a subject to pass some of the tasks and to fail some of the tasks at several successive age levels, it should not be too unusual for a subject to score some success on a level beyond a group where all the tests were failed. These later successes, as well as the earlier failures, may be due to a variety of factors.

The authors of the Revised Stanford-Binet state (10:65):

> No cross-section view of the performances characteristic of children en masse at particular age levels will ever be found to be perfectly characteristic of a given individual.

For clinical psychologists, whose primary interest is in the individual person, greater thoroughness in the use of the intelligence scale should be helpful to obtain greater insight for clinical procedure.

The test results of the Binet scale are expressed in terms of mental age and intelligence quotient. The age level at which all test items are passed (basal age) combined with the value in months of items passed above that level results in a mental-age score. But the authors point out (10:25):

> For one thing, it is necessary to bear in mind that the true mental age as we have used it refers to mental age on a particular intelligence test. . . . A subject has, strictly speaking, a number of mental ages; we are here concerned only with that which depends upon the abilities tested by the new Stanford-Binet scales.

Another important point for consideration of the mental-age unit is its tendency to decrease with age, so that (10:26)

> The difference in intellectual ability between the average child of fifteen and the average child of sixteen is so small that it can barely be detected by the most elaborate mental tests. Probably not one twelve-months-old child in a million has reached the mental level which is normal to the average child of two years, but almost half of the fifteen-year-olds have reached the level which is average for sixteen years. Increments beyond this point have not been clearly demonstrated for unselected subjects.

In regard to the mental ages at the upper end of the Stanford-Binet scales, the authors state that these are not true "mental ages," but are "more or less arbitrary scores designed to permit the computation of I.Q.'s of superior older subjects" (10:26).

The intelligence quotient, which is obtained by dividing the mental age by the chronological age, provides an index of brightness or dullness of a given subject as compared with others of his age.

Since it is more difficult to discriminate between the mental levels of older subjects because "the magnitude of the mental age unit shrinks rapidly as mental maturity is approached," it would seem advisable to make the range of

testing more thorough. It is the purpose of this study to investigate what gains occur, what changes there might be in mental age, when, in the administration of the Revised Stanford-Binet, Form L, the testing is continued beyond the first level where all test items are failed, which is the minimum of thoroughness demanded by the manual.

CHAPTER II

REVIEW OF LITERATURE

Since Terman recommended thorough testing of mental defectives in his 1916 manual, and then in the 1937 revision recognized the possibility of occurrence of successes even beyond the first level of failure, several studies have been made with mentally retarded subjects for whom the range of testing was extended through two or three levels of failure.

Berger and Speevack reported a random sampling of 193 elementary school children who had been referred for ungraded class placement to the Bureau for Children with Retarded Mental Development, New York. These psychologists found "marked unevenness and scattering among the pupils," and "a large percentage of retarded pupils who scattered beyond what is generally considered the range of testing" (1:39). The children in this study had a C.A. range of 7-1 to 15-10 and an I.Q. range from 50 to 111. In all instances the test was carried out to at least two year-levels in which there were all failures. The authors recognized the desirability of following the same procedure at the lower end of the scale; but because of the factors of possible fatigue and loss of rapport, this was not carried out. They compared the difference between the mental age if the test had not been continued beyond the first level of failure and the mental age when the test was extended. The results show an increase in 42 per cent of the cases, with an average increase of 3.2 months. The range of gains extended from zero to fourteen months. Though the change does not appear great statistically, the psychologists state (1:41):

> In clinical practice, it appears that the change is great enough to warrant the procedure of extending the test beyond the first zero point.

They also take up the possible criticism that to extend the range of testing is not standard procedure, and that the I.Q.'s thus obtained are not comparable to I.Q.'s obtained under the usual test procedure. However, the manual does not state that more thorough testing is not according to standard procedure. Furthermore, the possibility of successes beyond the first level of failure is recognized as due to the nature of the scale; and explicit directions are given that such successes "are taken account of" in computing the mental age.

Berger and Speevack also considered the factor of fatigue which might occur in prolonging the test. Though they could not answer the problem fully, they studied the number of items and year levels which were given to each child. The least number of items given to a child up to the point of his last success was twelve; the greatest number, 66. About 25 per cent of the children were given items from three to six years above their C.A. level, and 86 per cent were given items three years or more above their M.A. level. Almost 40 per cent of the children were given items five or more year levels above their M.A. levels. The authors conclude (1:43):

> Although this does not give us a definite measure of loss of rapport, it seems logical that when a child is confronted with items of such difficulty, he would easily become discouraged.

They recommended further investigation of the question of loss of rapport.

Another study of 215 mentally retarded children of the Minnesota School and Colony, Faribault, was reported by Carlton. The C.A., M.A., and I.Q. range of these children was as follows:

	Range	Mean
C.A.	7-6 to 17-3	14-2
M.A.	4-1 to 11-10	8-5
I.Q.	42 to 79	62.2

Of these children, 154 (72 per cent) had a C.A. from 13-0 to 17-5 (4:61).

All subjects were tested until all items were failed on three successive age levels. Of the 215 children, forty or 18.6 per cent passed items at higher levels after failing all items at one or more of the lower levels.

This author was also interested in studying the relative difficulty of the year levels XII and XIII, since he had a sizable group of subjects at the focal point. He found "that 27 or 67.5 per cent of the forty special cases passed tests at year XIII, after failing all tests at year XII." Also, "of these forty cases, 37 or 92.5 per cent completely failed whole age-levels between the test years IX and XII" (4:62).

Carlton further reported the number of levels on which successes occurred after a previous level of failure. Of the forty, 31 scored successes on one additional level; eight succeeded on two additional levels; and one succeeded through four additional levels.

He concludes (4:63):

> If, then, an examiner wishes to secure an accurate test, he will need to extend it at least one whole level beyond the year in which the child fails all items. This procedure is especially important if the child first fails a whole level between the test year IX and XII.

In studying the relative difficulty of the year levels XII and XIII for the ninety subjects in his study who passed one or more tests at either of these levels, he found that for 59 subjects (65.6 per cent) the year level XIII was easier, and for seventeen (18.9 per cent), this level was just as easy as XII (4:63).

Berger and Speevack also studied the test items which were passed after the first year of failure in an effort to determine which items allowed greater chance for success. By far the greatest number of these successes occurred on the year level XIII, especially on the word memory, problems of fact, and the problem of search. Items on other levels which showed frequent success beyond

the first year of failure were: drawing of designs from memory on IX and XI, making change on IX, and the picture absurdity (Frontier Days) on X (1:43).

G. Hildreth, in comparing test results obtained on the 1937 revised scale with those on the original Stanford-Binet scale, found what she called "inversion of success," which she described (7:51):

> In all Binet testing it is possible for a child to score no successes on a given level and to succeed on one or more items above that level.

In 43 cases who were given the Revised Stanford-Binet and who based above ten years, such inversion occurred 26 times. She went on to state that only two such cases of inversion were found in a total of 102 cases who based above ten years on the 1916 revision. When comparing the relative difficulty of age levels she found that the 1937 revision tends to show greater occurrence of gains at the age levels XI, XII, XIII, and XV (sic) (7:53).

Another study on the irregularity of successes on the Revised Stanford-Binet Form L, was reported by Harriman. From the performance of 200 fifth and sixth grade pupils (175 of whom based at X and 25 at XI), Harriman concluded that the test items at XII seem more difficult than at XIII (6:84). She also found tests at other levels with unusually high percentage of success and stated that perhaps there might be some question as to appropriate placement of certain tests (6:85).

One other study, reported by Bradway, included an unselected group of 126 subjects within a restricted age range (11 to 15). Her purpose was to compare the results of "standard procedure" with wider range testing: administering the test through at least two levels of success for a basal age and through at least two levels of failure. She found that 57 subjects had failures below the first basal year. In order to study results of testing through the upper limits, she had to eliminate all who passed the levels up to Superior Adult III. Only 65 cases remained for study of two fail-levels. Of these, eighteen, or almost

thirty per cent, passed items above the first all-fail year. Twelve passed one item; three passed two items; and three passed three items. Gain in mental age months ranged from two to eighteen. Items passed five or six times above the first all-fail year were the enclosed-box problem on Superior Adult I and the orientation on Superior Adult III.

However, Bradway concluded that "the differences in I.Q.'s based on the standard and extended testing procedures were not significant" (3:181). She criticized the wider range testing as a departure from standard procedure and questioned the reliability, validity, and prognostic values of extending the range of testing. She admitted the possibility of more significant differences for special groups (such as feebleminded, superior, etc.) or for other age levels. Though she found no significant change in I.Q., she ignored the clinical significance of the gains which did occur. Berger and Speevack in their study made the following comment which might be applied here:(1:42):

> Since clinical practice deals with individuals rather than with measures of central tendency, the range of change of I.Q. appears significant.

Less directly related to the studies mentioned above, are the reports of Bijou, Speer, and Davis on the concept of "Highest Binet Attainment." Bijou contended that for a number of reasons, the intellectual capacity of certain groups of subjects would not be diagnosed adequately by the Stanford-Binet scale. He brought out the need to consider factors other than intellectual which would influence a subject's performance on a test, whether that test be verbal or non-verbal. Bijou claimed that often test scores were lowered by non-intellectual factors. These factors he described as "mental control," and stated that this mental control is manifested on tests demanding sustained memory, concentration, accuracy, planfulness, efficiency, relevancy, and the like (2:521).

In studying the performance of subjects on the feebleminded-moron level,

Bijou looked for some reliable "intra-test differences" between real morons and "test morons," i.e., "those who have moron I.Q.'s because of the undermining influence of non-intellectual factors." He studied 83 cases and found the most outstanding differences in comparing the scatter (2:522).

> Some Binet I.Q.'s were derived from subscores which, for the most part, varied within the limits of the feeble-minded category, while others were derived from scores which varied over a wide range beginning at the defective classification and extending through to the average intellectual levels.

He devised a method of rescoring as follows (2:523):

> The mental age and I.Q. of upper mental age attainment of the Binet was ascertained by adding the number of M.A. months earned at the upper limit, to a newly assumed basal taken at the year immediately below it. . . . This procedure is justified (sic) on the assumption that an individual could pass all subtests below his highest level of attainment, as expressed on the Binet, were it not for the lowering effect of non-intellectual factors. Scattered successes at the higher levels of the Binet are not conceived of as special abilities or aptitudes.

No mention was made of the extent of the range of testing, whether it went beyond a single level of failure or not.

Speer made an independent study and criticized the above procedure of rescoring. He said it was a "juggling the test result" and that it rewarded "scatter out of all proportion to its importance" (8:697, 698).

Davis, who made a further study of this question, commented on the fact that neither Bijou nor Speer stated whether they allowed for occurrence of successes above the level of total failure. She went on to say that it has been her practice "to continue the test until I am convinced that no more items will be passed," and conversely, if a child passed all at the VI year level, failed to repeat five digits at VII, she did not credit him with items below 72 months until sure he was able to repeat four digits. She found that this extended testing procedure gave an increase in I.Q. which was seldom more than two or

three points (5:699),

> yet the insight into the child's grasp of practical affairs, methods of work, or special abilities may be very illuminating. This is particularly important in a beginning program, where decisions must often be made in emergencies yet the future prestige of clinical work demands that error be held to a minimum.

Davis studied 367 records of the Revised Stanford-Binet, Form L. C.A. range was from less than five years to Adult; I.Q. range, from 20 to 155. She mentioned that many special handicaps were involved since the subjects had been referred to determine educability, etc. She rescored the records according to the "highest Binet attainment" method and concluded that there was no practical advantage in using such procedure, even with reading cases.

The studies reported in psychological literature which have considered the question of wider range testing on the Revised Stanford-Binet have been carried out with groups which were restricted as to ability or age level. In every study gains were reported for a considerable percentage of cases, varying from 18.6 per cent to 42 per cent. Though average increase in M.A. months or I.Q. points was not found to be highly significant, most of the writers recognized the clinical value of such gains.

CHAPTER III

METHOD OF SECURING DATA

The value of lengthening the range of testing on the Revised Stanford-Binet, Form L, in order to have a more thorough test, was examined anew in the present study with a fairly large group of subjects who had been referred for psychological service to the Loyola Center for Guidance. It was possible to obtain a more or less typical sample, not of the general population, but of persons coming to a guidance center. In general, reasons for referral to the Center included a wide range of behavior difficulties, school adjustment problems, serious retardation, and special disabilities. It is noteworthy that in such a population the proportion of very slow and very bright subjects is somewhat greater than in a cross-section of normal population.

The records chosen for this study were obtained during a period of about two and a half years. Most of the examiners at the Center during that period observed the practice of continuing the testing beyond the first level of failure whenever feasible. Approximately 400 records of tests administered between October, 1945 and February, 1948 were found to have been continued through at least two levels of failure.

Of about 150 other records, approximately fifty subjects scored successes through the Superior Adult II level, which precluded the possibility of testing beyond a first ceiling; fifty others had successes through the Superior Adult III level, which did not permit any ceiling at all. On the remaining fifty records it was found that, for a variety of reasons, the examiners had tested only through a single level of failure.

The examiners whose records were studied included ten full-time psychologists (permanent personnel and additional summer workers at the Loyola Center)

and several other psychologists working either part-time or as volunteers, who had served the Center at various intervals during this period. All had had extended training and practice under supervision in the techniques of Stanford-Binet testing.

The 400 record booklets were examined, and pertinent data were recorded on individual work sheets. (See sample in Appendix II.) This included the subject's name, sex, chronological age, mental age, intelligence quotient, the examiner's name, and the date of examination. The scatter of successes and failures was recorded, together with comments on the subject's test behavior (cooperation, attention, confidence, etc.) and other factors which might have influenced performance, such as special handicaps, tension, etc., whenever this information was available.

The collected data were tabulated to obtain the range of chronological age, mental age, and intelligence quotient for the entire group. The records of those subjects who scored additional successes beyond the first ceiling were separated from the whole group. The quantitative analysis of the performance of the total group and of the group where successes occurred beyond the first ceiling is presented in the following chapter. In addition to calculating the means, medians, and standard deviations, a bar graph was used to compare the distribution of chronological age, mental age, and intelligence quotient for the group who had additional successes with the distribution of the entire sample.

The additional gains earned by subjects who succeeded on test levels beyond the first ceiling were then computed and arranged in scatter-diagrams to show the occurrence of gains at various levels of mental age and intelligence quotients. More careful analysis was made of the gains occurring within the average range (90 to 110 I.Q.), since the greatest proportion of the records fell within this group.

Further study was made of the frequency with which total failure occurred at each test level. Scatter-diagrams were constructed to show for each test level the ratio between the number of subjects who had additional successes beyond the ceiling and the total number who failed at that ceiling.

The frequency with which specific test items were passed after a ceiling had already been established was also studied. Some analysis was made of the extent to which the range of testing was increased in continuing beyond the first ceiling. Tabulations were made of the number of additional levels of success and additional levels of failure which were administered to the group who scored successes beyond the first ceiling.

To simplify the description of the three main groups discussed in this study, the following designations will be used in the subsequent chapters:

T-group: total sample of 400 subjects for whom testing was extended beyond the first level of complete failure.

S-group: the 151 subjects who scored additional successes beyond the first level of failure.

O-group: those 249 subjects who did not have additional successes beyond the first level of failure.

CHAPTER IV

ANALYSIS OF DATA

The total sample, as well as the range of C.A., M.A., and I.Q., is considerably greater for the group of subjects included in this study than for those reported in previous studies. The composition of the groups is revealed in the following table.

TABLE I

CONSPECTUS OF TOTAL SAMPLE AND SUB-GROUPS OF SUBJECTS WHOSE RECORDS WERE USED IN THE PRESENT STUDY

	Group	Number	Range	Median	Mean	Standard Deviation
C.A.	T-Group	400	3-11 to 23-10	10-7	10-9	36.2 mos.
	S-Group	151	4-6 to 18-10	10-6	10-9	33.9
	O-Group	249	3-11 to 23-10	10-8	10-9	37.5
M.A.	T-Group	400	2-4 to 17-0	9-10	9-10	36.6 mos.
	S-Group	151	3-0 to 17-0	9-8	10-1	31.5
	O-Group	249	2-4 to 15-10	10-2	9-9	37.6
I.Q.	T-Group	400	30 to 146	96	94	21.9 pts.
	S-Group	151	32 to 146	99	96	21.1
	O-Group	249	30 to 144	93	93	22.3

The deviations found for the group of subjects in this study are greater than the deviations given by Terman. He reported standard deviations of I.Q.'s ranging from 14.2 to 20.6, with a median value "slightly in excess of 16 points" (10:40). The somewhat higher deviations found in this study may be accounted for

by the fact that this is a population of clinical subjects and includes more than the average of very slow and very bright children.

It is also necessary to keep in mind that the mean as well as the median values of I.Q. and M.A. were somewhat lowered because it was necessary to exclude about 100 records of brighter subjects who passed items on the upper Superior Adult levels.

Of the 400 subjects for whom it was possible to continue testing beyond the first ceiling, 151 or 37.7 per cent of the total group scored further successes. The gains ranged from one to fourteen M.A. months and from one to thirteen points in I.Q. Taken in aggregate, the average gain in M.A. was 4.5 months, and 3.6 points in I.Q. As such, the gain may not appear significant, especially since, in the standardization process of the scale, the probable error in I.Q. was found to be approximately .03.

Perhaps the most striking feature of the findings in the present study is the close consistency in the pattern of distributions of the T-group and the S-group. Previous studies have found instances of gain occurring within a restricted range of I.Q. or C.A. and have dealt for the most part with mentally retarded subjects. The gains found with the unselected group of clinic subjects in this study are so distributed that it is evident that this phenomenon is not characteristic of any particular level of mental ability. It occurs with the younger and older, the slower, the average, and the brighter subjects alike.

Figure I, page 19, shows the distribution of the I.Q.'s for the T-group as compared to the distribution for the S-group. The curve is fore-shortened at the higher levels for reasons stated on the previous page. It is interesting to note that in the S-group 74 subjects, or 49 per cent, fell within the I.Q. range (90 to 109) frequently described as normal or average. In the T-group, 172 subjects had I.Q.'s in the average range; and of these, 43 per cent had suc-

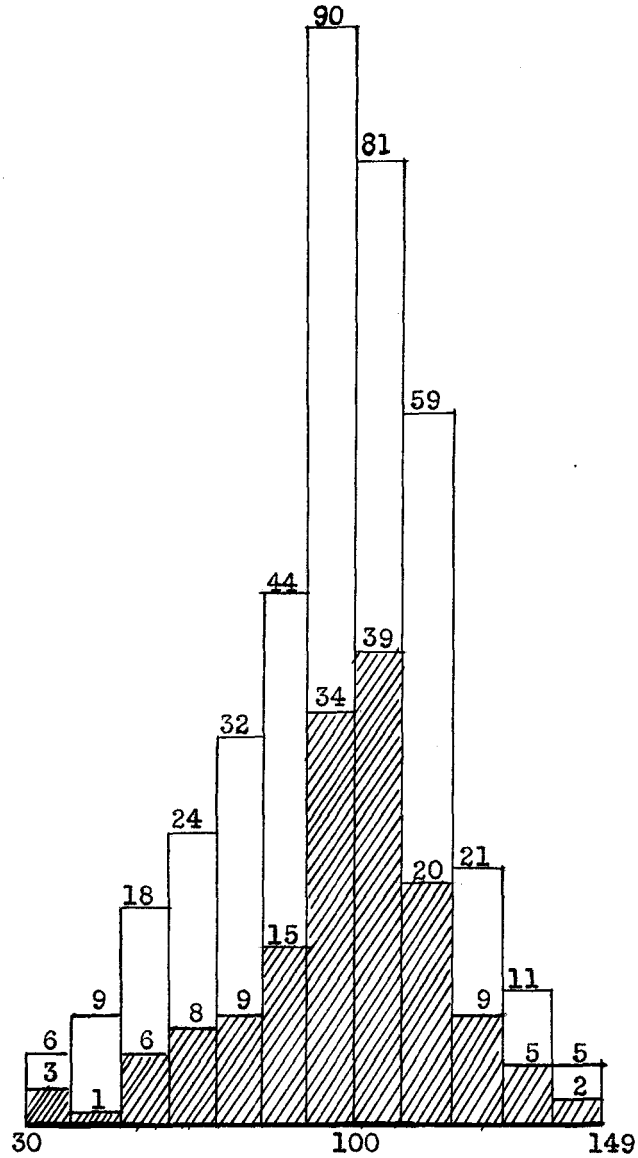

Figure I. Distribution of I.Q.'s for the T-Group as Compared with the S-Group. Shaded portion indicates the latter group. Each bar division indicates a 10-point I.Q. step.

cesses beyond the first ceiling.

Since the biggest cluster of cases in this sample occurred in the average range, a further breakdown makes the significance of the phenomenon more evident. Table II shows according to I.Q. levels the number of additional points earned by the subjects in the S-group.

TABLE II

NUMBER OF SUBJECTS, ACCORDING TO I.Q. LEVELS, WHO GAINED ADDITIONAL POINTS BEYOND THE FIRST CEILING

I.Q. Levels	Number of I.Q. points gained											Total Subjects
	1	2	3	4	5	6	7	8	9	10	13	
30-39	2	1										3
40-49	1											1
50-59	2	2		1			1					6
60-69	2	1	1	2	1		1					8
70-79	1	3	2	2	1							9
80-89	1	6	5	2			1					15
90-99	1	13	8	5	2	1	3	1				34
100-109		7	16	5	5	3	2			1		39
110-119		3	6	7		2	1		1			20
120-129		2	2	2		1			1		1	9
130-139			1	2		1	1					5
140-149			1				1					2
Total Subjects	10	38	42	28	9	8	11	1	2	1	1	151

For the group of subjects within the range of 90 to 109 I.Q., the gains ranged from one to ten I.Q. points. A gain of one, two, or three points would hardly be significant, and the majority of the subjects in this group did not gain more than that. However, there were eighteen subjects (approximately 24 per cent of the cases who had additional successes, or about ten per cent of the total sample within the middle range) who achieved a gain of five to ten points when testing was continued beyond the first ceiling. The average gain for this small group was 6.2 points.

The chronological ages for the group of 172 subjects within the middle range of intelligence extended from five years to 17-11 years with the median slightly above ten years. Interestingly enough, the highest gains of the group (seven to ten points) occurred on the levels between 9-0 and 12-11.

The distribution of the chronological ages of the total sample of 400 subjects, as compared with the chronological age distribution of the 151 subjects in the S-group, is shown in Figure II, page 22. For statistical presentation of distribution, see Table I, page 17.

In Figure III, page 22, the distribution of mental ages of the T-group is shown as compared with the S-group. In the mental age scatter, the median for the T-group was 9-10 and the mean, 9-10, but the curve was somewhat bi-modal, with peaks at levels 9-0 to 9-11 and 12-0 to 12-11.

Table III, page 23, shows according to M.A. levels the number of additional months earned by the subjects in the S-group. In studying the distribution of gains in M.A. months, it was found that 69 subjects, or 45.7 per cent, fell between the M.A. levels 8-0 to 11-11. Here also, a gain of one to four months in mental age would not be considered important, and more than two-thirds of the subjects did not make greater gains. However, twenty subjects (approximately 29 per cent of the group who had additional successes, or about 12 per cent of

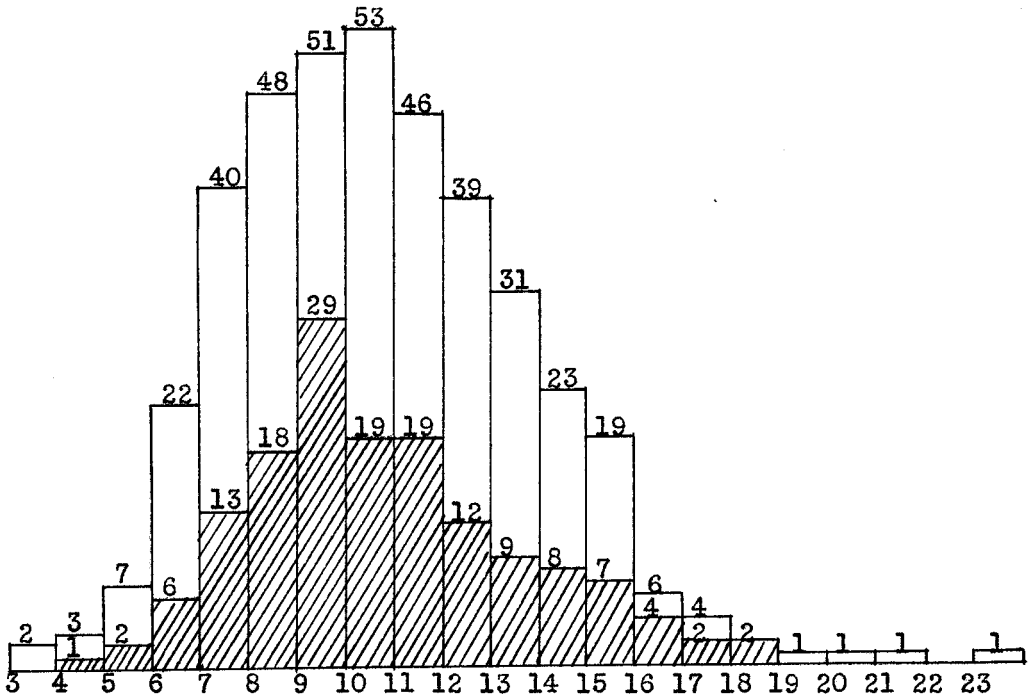

Figure II. Distribution of C.A.'s for the T-Group as Compared with the S-Group. Shaded portion indicates the latter group.

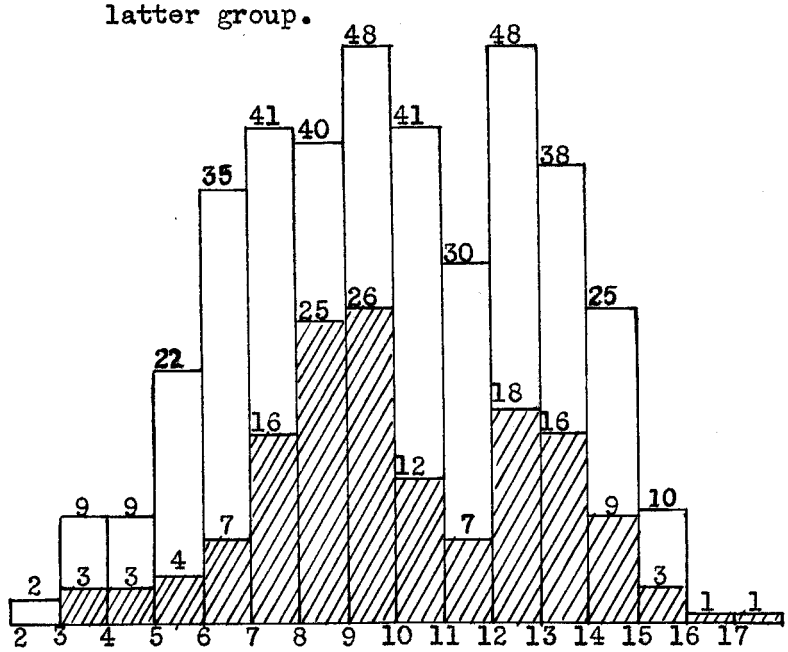

Figure III. Distribution of M.A.'s for the T-Group as Compared with the S-Group. Shaded portion indicates the latter group.

the total sample within this M.A. range) achieved a gain of six to twelve months of mental age when permitted to go on beyond the first ceiling. The average gain for this group was 7.8 M.A. months.

TABLE III

NUMBER OF SUBJECTS, ACCORDING TO M.A. LEVELS, WHO GAINED ADDITIONAL M.A. MONTHS BEYOND THE FIRST CEILING

M.A. Levels	Number of M.A. months gained														Total Subjects
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
3-0 to 3-11	3														3
4-0 to 4-11		1		1		1									3
5-0 to 5-11		3		1											4
6-0 to 6-11		6		1											7
7-0 to 7-11		8		7		1									16
8-0 to 8-11		12		5		5		1		1		1			25
9-0 to 9-11		8		10		3		4		1					26
10-0 to 10-11		1		7	1	1		1				1			12
11-0 to 11-11				6						1					7
12-0 to 12-11				13	2				1	1				1	18
13-0 to 13-11		7	4					2	2	1					16
14-0 to 14-11					3	4		1					1		9
15-0 to 15-11						3									3
16-0 to 16-11						1									1
17-0 to 17-11						1									1
Total Subjects	3	46	4	51	6	20	0	9	3	5	0	2	1	1	151

From a clinical standpoint, this finding is quite important. The Revised Stanford-Binet scale has been carefully standardized. Yet, when the usual procedure of stopping with one ceiling is used by a well-trained examiner administering the scale to a child of apparent average ability, there is likelihood of a sizable error in one out of ten instances. It is necessary to keep in mind that many human variables are involved in an examination of this type---in the construction of the scale, in its administration (involving both examiner and examinee), and in scoring. Big errors may occur in a small number of cases; small errors, in many cases. Since this test is intended for use with individuals, the possibility of error as found in this study is very significant, especially in clinical practice.

An analysis was also made of the frequency with which total failure (first ceiling) occurred at each test level for the whole group. Then, the number of subjects who had additional successes beyond this first ceiling was compared with the total number of subjects who failed at each particular level. Table IV, page 25, compares the subjects in the S-group, arranged according to I.Q. levels, with all subjects whose first ceiling occurred at each respective test level. In this way one can see at a glance what proportion of subjects had successes after complete failure at any given level. The ratio at each level is expressed as a common fraction, with the denominator representing the total number of subjects who failed that level and the numerator giving the number of subjects who had additional successes at subsequent levels.

It will be noticed, in studying Table IV, that there are marked irregularities in the frequency with which failures occurred at several test levels. These irregularities are expecially notable within the average range where the population is very large. Most outstanding are the figures at the XII level where 72 per cent of those who encountered their first ceiling at this level

TABLE IV

RATIOS OF NUMBER OF SUBJECTS, ACCORDING TO I.Q., WHO HAD ADDITIONAL SUCCESSES BEYOND THEIR FIRST CEILING TO THE TOTAL NUMBER OF SUBJECTS WHOSE CEILING OCCURRED AT EACH SPECIFIC TEST LEVEL

Year Level	30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	Total
III	0/1												0/1
III-6	0/1												0/1
IV	1/1	1/2											2/3
IV-6	1/1	0/1	1/1										2/3
V		0/1	1/1					0/1					1/3
VI		0/2	0/2	1/1									1/5
VII	0/1		1/2	0/3	0/3	0/1		1/2	1/1	0/1	1/1		4/15
VIII	1/1		0/2	1/4	0/4	1/2	1/2	0/1	0/1				4/17
IX		0/3	2/7	3/7	2/4	1/1	3/8	3/4	1/6	1/2	0/1		16/43
X					0/2	2/3	1/2	2/3	0/2				5/12
XI			0/2	2/3	3/4	3/6	7/12	1/1	1/5				17/33
XII			1/1	1/1	3/4	3/7	9/11	13/14	5/8	2/2			37/48
XIII				0/3	1/1	0/1	2/4	1/4	0/1				4/14
XIV				0/2	0/3	2/12	0/7	0/7	0/2	1/2	0/3		3/38
A.A.					0/7	3/8	7/18	12/23	4/16	4/4	3/3	2/3	35/82
S.A. I						0/1	4/16	3/6	6/8	0/2		0/1	13/34
S.A. II						0/2	0/10	3/15	2/9	1/8	1/3	0/1	7/48
Total	3/6	1/9	6/18	8/24	9/32	15/44	34/90	39/81	20/59	9/21	5/11	2/5	151/400

had further successes at upper levels. In sharp contrast, it will be observed that at both of the levels that follow, especially at the XIV level, the occurrence of additional successes at upper levels is markedly infrequent. This finding is explained to some extent by the fact that the Average Adult level which follows proved to be very difficult for many of the subjects. Of the entire sample, 82 subjects (by far the largest group) had total failure at this level.

Table V, page 27, compares the subjects in the S-group arranged according to M.A. levels with all subjects whose first ceiling occurred at each respective test level. In the general M.A. distribution for the entire sample, the largest group of cases occurred at the Binet M.A. level 9-0 to 9-11 and again at the level 12-0 to 12-11. (See Figure III, page 22.) Within the first group, 26 out of 48 subjects (54 per cent) had additional successes beyond the first ceiling. Of these 48 subjects who had a mental age between 9-0 and 9-11, 22 reached their first ceiling at the XII test level. And of these 22 subjects, 20 had additional successes at subsequent levels.

Within the group whose mental ages ranged from 8-0 to 8-11, 25 out of 40 subjects (63 per cent) had additional successes beyond the first ceiling. For the group whose mental ages ranged from 12-0 to 12-11, 18 out of 48 subjects (37 per cent) gained additional M.A. months beyond the first ceiling.

The results show a tendency for irregularity of successes and failures on a complete test level followed by additional successes on subsequent levels, to occur more frequently through the middle and upper range of the scale. This would bear out a point made by Terman which was previously quoted (see page 5); namely, that it becomes more difficult to discriminate between the mental levels of subjects as they approach maturity. Hence, there is greater possibility and greater occurrence of a wider scatter of successes and failures at the upper end of the scale.

TABLE V

RATIOS OF NUMBER OF SUBJECTS, ACCORDING TO M.A. LEVELS, WHO HAD ADDITIONAL SUCCESSES BEYOND THE FIRST CEILING TO THE TOTAL NUMBER OF SUBJECTS WHOSE CEILING OCCURRED AT EACH SPECIFIC TEST LEVEL

Year Level	M.A. Levels *																Total
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
III	0/1																0/1
III-6	0/1																0/1
IV		2/3															2/3
IV-6		1/2	1/1														2/3
V		0/1	1/2														1/3
VI		0/3	1/2														1/5
VII			0/4	3/9	1/2												4/15
VIII				1/6	3/11												4/17
IX				0/7	3/20	11/14	2/2										16/43
X					0/2	1/6	4/4										5/12
XI						3/15	9/13	5/5									17/33
XII						1/4	10/16	20/22	6/6								37/48
XIII						0/1	0/4	1/5	2/3	1/1							4/14
XIV						0/1	0/1	0/13	1/17	1/4	1/1	0/1					3/38
A.A.								0/3	2/14	5/24	15/26	11/13	2/2				35/82
S.A. I									1/1	0/1	2/12	5/11	5/9				13/34
S.A. II											0/9	0/13	2/14	3/10	1/1	1/1	7/48
Total	0/2	3/9	3/9	4/22	7/35	16/41	25/40	26/48	12/41	7/30	18/48	16/38	9/25	3/10	1/1	1/1	151/400

* Step Interval: 2-0 to 2-11, etc.

Some analysis was also made of the specific test items which were passed after subjects had failed a complete test level. The frequency with which such additional gains occurred for each test item is listed in Appendix I.

The results indicate that the greatest frequency of successes following a total level of failure occurred at the XIII level, which corroborates previous findings. Harriman found, in studying the Revised Stanford-Binet performances of 200 fifth and sixth grade pupils, that the "test items at the XII seem more difficult than at XIII" (6:83). Carlton found that with ninety subjects who passed one or more tests at either of the two levels, the XIII level was easier for at least 65.6 per cent of the group (4:63). Berger and Speevack also reported a greater incidence of test items passed, after the first level of failure on the XIII level than on any other level (1:43).

In the present study, it was found that the items passed most frequently at the XIII level were, in order of frequency: the problems of fact, plan of search, memory for words, and copying a bead chain from memory.

Another item which appeared disproportionately high in frequency of successes after the first ceiling was the enclosed box problem on the Superior Adult I level. Harriman likewise found a very high percentage of success on this item and stated that there might be some question as to the proper placement of some of the test items at the superior levels (6:85).

One further question, which has been considered to some extent in previous studies, might be discussed briefly at this point: to what extent was the test prolonged when testing was continued beyond the first ceiling. Berger and Speevack gave some consideration to this question in studying the number of items administered to each child from the basal year to the level of the last success. Such findings might have some relation to the question of fatigue and probable loss of rapport. These authors found a range of items from 12 to

66, with a median at about 42 items (1:43).

A clinical psychologist, of course, must be alert to indications of fatigue, loss of interest, and possible discouragement as manifested in a child's behavior during the examination. However, a clinical psychologist is interested in knowing a child's capacity for sustained effort, or the shift of attitude which is displayed with repeated encounters of failures. Quite obviously, the psychologist needs to use discretion and, when advisable, does not prolong the test. The psychologists at Loyola Center, though interested in obtaining accurate and thorough test results, did not follow a hard-and-fast rule, and, as was previously mentioned, occasionally terminated the testing at the first ceiling level.

For the great majority of the 400 subjects included in this study, testing was not continued beyond a second level of failure. For the 151 subjects in the S-group, the examination was continued through one or two additional levels of failure. In six instances only, the testing extended through three additional levels of failure. These were not consecutive, but occurred at intervals between levels where there were some successes. In such instances, the scatter of successes and failures was unusually wide and irregular.

Tables VI and VII give some indication of the number of additional levels which were administered to the 151 subjects who had successes after the first ceiling. Table VI shows the number of subjects, arranged according to I.Q. levels who had successes at one, two, or more levels beyond the first ceiling.

For three-fourths of these subjects, additional successes occurred only at one level beyond the first ceiling. About 21 per cent scored successes on two additional levels. Table VII, page 31, shows the number of subjects, arranged according to I.Q. levels, who had to undergo one or more additional levels of failure beyond the first ceiling. About forty per cent encountered only one more level of failure after the final successes. About 48 per cent had to pass

through two additional levels of failure, though occasionally these did not occur consecutively. Where additional successes occurred on the Superior Adult III level, there were no additional levels of failure. Occasionally, the psychologists found it necessary to stop tests before a second ceiling was established.

TABLE VI

NUMBER OF SUBJECTS, ACCORDING TO I.Q. LEVELS, WHO HAD ADDITIONAL SUCCESSES AT ONE, TWO, OR MORE LEVELS BEYOND THE FIRST CEILING

I.Q. Range	Levels				Total Subjects
	1	2	3	4	
30-39	2	1			3
40-49	1				1
50-59	4	1	1		6
60-69	4	3		1	8
70-79	4	5			9
80-89	9	6			15
90-99	25	8	1		34
100-109	33	5	1		39
110-119	19	1			20
120-129	7	1		1	9
130-139	4	1			5
140-149	1	1			2
Total Subjects	113	33	3	2	151

TABLE VII

NUMBER OF SUBJECTS IN THE S-GROUP, ACCORDING TO I.Q. LEVELS, WHO ENCOUNTERED ADDITIONAL LEVELS OF FAILURE AFTER A FIRST CEILING

I.Q. Range	Levels				Total Subjects
	0	1	2	3	
30-39	2	1			3
40-49			1		1
50-59		1	3	2	6
60-69		2	5	1	8
70-79		3	6		9
80-89		4	10	1	15
90-99	2	12	18	2	34
100-109	3	18	17	1	39
110-119	2	11	7		20
120-129	1	5	3		9
130-139	1	2	2		5
140-149		1	1		2
Total Subjects	11	60	73	7	151

Some might contend that taking a subject through a second, third, or fourth level of increasing difficulty would not be justified by the relatively few successes which usually occur when testing beyond the conventional stopping point, the first ceiling. To extend the test and yet maintain rapport with the subject calls for skilful handling on the part of the psychologist. The experience may and often does prove very revealing. A clinical psychologist is interested in more than the test scores. He is duly concerned about maintaining rapport in

administering an examination, but also wants to know as much as possible about the subject, in order to have a clearer picture for clinical study.

After considering the quantitative gains which accrue when the range of testing is extended beyond the first ceiling, one might still question the advisability of giving the subject so much added experience of failure. A qualitative analysis of performance and of the gains would be a very great help in answering this question. The qualitative analysis is beyond the scope of this thesis. It would require extensive development of special procedures for purposes of comparison. It is hoped that such an analysis will be made in some future study.

CHAPTER V

SUMMARY AND CONCLUSIONS

The present study was undertaken to determine the effect of lengthening the upper range of Binet testing. For several years it has been the policy of the psychologists at the Loyola Center for Guidance to continue testing beyond the first ceiling, except when it appeared advisable not to prolong the examination beyond this point.

Of about 550 recent records of the Revised Stanford-Binet examinations, Form L, 400 were found where the examiners had been able to continue testing beyond the first ceiling. In about fifty instances, the examiners did not prolong the examination beyond the first level of failure. On the remaining 100 records not included in this study, the subjects had scored successes through upper levels, precluding further exploration beyond the first ceiling.

Previous studies have been confined either to mentally retarded subjects, or restricted age levels, and generally to groups of about 200 or less. In the present study, 400 subjects were included, with a wide range of C.A., M.A., and I.Q. The composition of the group is presented statistically in Table I on page 17.

Of the total sample of 400 subjects, 151 (37.7 per cent) scored further successes at one or more upper levels. The gains ranged from one to fourteen months of Binet mental age, and from one to thirteen points in the intelligence quotient. Average gain in mental age was 4.5 months; in intelligence quotient, 3.6 points.

It was noteworthy that the subjects, whether in terms of I.Q., C.A., or M.A., followed approximately the same distribution pattern as the total sample. It became evident that recurrence of successes was not limited to any particular

group. Since both distributions approximate to the normal, it further became evident that this phenomenon was relatively frequent in the normal range.

In analyzing results at particular test year levels, most remarkable were the findings at the test year XII. Of all the subjects (48) who encountered their first ceiling at this level, 72 per cent (37) had further successes at the upper levels. There was a sharp drop in the frequency of failure at the test year XIII. At test year XIV, 38 subjects had total failure; but only three had successes beyond that ceiling. At the Average Adult level which follows, 82 subjects (by far the largest group) had total failure.

In analyzing the additional successes which occurred after the first ceiling, it was found that such successes happened most frequently at the test year XIII, corroborating the findings in previous studies. The test items passed most frequently were: at test year XIII, problems of fact, plan of search, memory for words, and copying a bead chain II; at Superior Adult I, the enclosed-box problem.

Of those who had additional gains, it was found that about 25 per cent had some successes on more than one upper level. The burden of the extra items administered to obtain this full exploration was considerable, since it entailed bringing the subject through a total of two or three levels of complete failure. The present study did not attempt to give evidence of the effect which added experience of failure would have on rapport and possible fatigue. However, to expose a subject to additional experience of failure might be justified by the opportunity to obtain added insight into the subject's ability for sustained effort and self-criticism as manifested when coping with failures.

CONCLUSIONS

1. It seems valuable for full clinical study to extend the range of testing beyond the first ceiling level on the Revised Stanford-Binet, Form L.

2. In this study, successes beyond the first ceiling were found to be most frequent for the subjects in the middle range of intelligence.

3. There appear to be marked differences in difficulty between adjacent test levels and between test items on a single level through the middle and upper range of the scale.

4. In view of the high frequency of additional successes in this middle range (between test years IX and XIV) exploration beyond the first ceiling appears to be particularly desirable.

APPENDIX I

FREQUENCY WITH WHICH SUBJECTS, ACCORDING TO I.Q. LEVELS, PASSED SPECIFIC ITEMS ON TEST LEVELS AFTER THE FIRST CEILING

Test Year Level	Test Item	Description	Subjects' I.Q. Levels											Total Subjects
			30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	
IV-6	2	Repeating 4 digits	1												1
	5	Three commissions		1											1
V	2	Picture completion: Man			1										1
	3	Paper folding: Triangle	1												1
	4	Copying a square			1										1
VI	1	Vocabulary			1										1
	6	Maze tracing			2										2
VII	2	Similarities				1									1
VIII	2	Memory for stories: The Wet Fall			2					1			1		4
IX	1	Paper Cutting I								1					1
	3	Memory for designs				1									1
	5	Making change						1							1
	6	Repeating 4 digits reversed	1												1

APPENDIX I (Continued)

Test Year Level	Test Item	Description	Subjects' I.Q. Levels											Total Subjects
			30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	
X	1	Vocabulary			1	1									2
	2	Picture Absurdities: Frontier Days				1	1		3	3	1				9
	4	Finding reasons I				1	1	1			1				4
	6	Repeating 6 digits	1		1	2	1					1			6
XI	1	Memory for designs						2							2
	2	Verbal absurdities III					1			1					2
	3	Abstract words I						1	1						2
	4	Memory for sentences IV			1	1	1		1	1		1			6
	5	Problem situation				1		1	1	2		1			6
	6	Similarities: three things				1									1
XII	2	Verbal absurdities II						1	2						3
	3	Response to picture: Messenger Boy				1	1		1						3
	4	Repeating 5 digits reversed					1	1	2		1	1			6
	5	Abstract words II				1									1
	6	Minkus completion					1				1				2

APPENDIX I (Continued)

Test Year Level	Test Item	Description	Subjects' I.Q. Levels											Total Subjects
			30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	
XIII	1	Plan of Search				2	2		4	8	3	1			20
	2	Memory for words				1	2	3	1	7	3	1			18
	3	Paper Cutting I							2	2					4
	4	Problems of fact			1	3	3	2	9	10	4	2			34
	5	Dissected sentences								1	1				2
	6	Copying bead chain from memory II					1	1	6	5	2				15
XIV	1	Vocabulary							1						1
	2	Induction								3					3
	3	Picture absurdities: The Shadow				1		1	2	3					7
	4	Ingenuity							1						1
	5	Orientation: Direction I				1	1		2						4
	6	Abstract words II					1		2						3
Aver. Adult	7*	Memory for sentences V						1		1		1			3

* This level contains 8 test items.

APPENDIX I (Continued)

Test Year Level	Test Item	Description	Subjects' I.Q. Levels												Total Subjects
			30-39	40-49	50-59	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	
Sup. Adult I	2	Enclosed box problem						2	5	9	4	3	2	1	26
	3	Minkus completion					1					1			2
	4	Repeating 6 digits reversed					1	1	1	2		1	1	1	8
	6	Essential similarities								2		1	1		4
Sup. Adult II	2	Finding reasons II							1		3	1			5
	3	Repeating 8 digits							1	2	1		1		5
	5	Reconciliation of opposites							1	2					3
	6	Repeating thought of passage									2			1	3
Sup. Adult III	2	Orientation: Direction II					1			2			1		4
	4	Paper cutting II							2	1	2	1			6
	6	Repeating 9 digits							1		1				2

APPENDIX II

Name _____ File No. _____ C.A. _____

Sex _____ Examiner _____ Date _____ M.A. _____

I.Q. _____

II.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

II-6
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

III.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

III-6
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

IV.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

IV-6.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

V.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

VI.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

VII.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

VIII.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

IX.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

X.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

XI.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

XII.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

XIII.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

XIV.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

A.A.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____ _____

S.A. I.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

S.A. II.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

S.A. III.
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____ _____

Cooperation _____ Confidence _____

Remarks:

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for

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APPROVAL SHEET

The thesis submitted by Irene Staniszewski has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis, and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

May 26, 1948
Date

Charles I. Doyle, S.J.
Signature of Adviser